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PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) CASSETTE

(71) We, VEB FILMFABRIK WOLFEN, a Company recognised under German Law, of Wolfen, Kreis Bitterfeld, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a cassette made of a synthetic material having deep-drawing properties, which cassette may be used for packaging sheet-like materials, especially light-sensitive materials, for example sheet film or photographic paper.

Photographic sheet film and paper are at present packed in paperboard cartons or boxes, after being suitably wrapped or sealed in paper or foil. This form of packing is very expensive as regards packing material and is not very suitable for an automated packing process. In addition, a package of this kind can only be opened by hand, and the sheets contained in the package can only be withdrawn by hand. Consequently, automatic processing of the material is impossible without first manually reloading it into another container.

The present invention provides a cassette which comprises a container section having a base and side walls, and a lid for the container section, at least the container section comprising a synthetic material capable of being deep-drawn, each of the side walls of the container section having at least one inwardly projecting rib, the innermost edge of each rib being substantially perpendicular to the general plane of the cassette base.

A cassette according to the present invention substantially eliminates the above-mentioned disadvantages of previous packages, and enables the sheet-like materials to be packed in a line-production system. The cassette can be obtained by mechanised production in the packing plant and allows the automatic loading and withdrawal of the sheet material. The cassette is designed to store the sheets in a manner

which prevents their displacement on any side.

The cassette comprises a container section and a lid, each of which may be moulded from a sheet of a synthetic material, for example a thermoplastic film. To obtain a light-proof cassette, the material which is used is dyed, for example black. The container section of the cassette comprises a base and side walls which are tapered inwards towards the base because the deep-drawing cupping tool used to form this section must be at least slightly conical in shape to allow for its removal from the moulding. In order to ensure the accurate stacking of the sheets, i.e. so that the sheets will not shift laterally relative to one another, each side wall is provided with at least one inwardly projecting rib, the innermost edges of these ribs being perpendicular to the general plane of the cassette base. The moulding tool can still be easily withdrawn from the moulded cassette since the only non-tapered items are the edges of the ribs, which do not present any frictional difficulties. However, the edges of mouldings produced by a deep-drawing process are not sharp and always have a certain curved nature. The result of this is that the upper and lower extremities of the rib-edges are not accurately perpendicular to the basal plane, which means that the accurate stacking of the sheets cannot be ensured at the bottom and the top of the cassette.

The base of the cassette is preferably provided with two or more inwardly drawn support ribs such that the plane which includes the tops of these support ribs intersects the innermost edge of each of the ribs provided on the side walls of the cassette at a point where the said innermost edge is still perpendicular to the basal plane of the cassette. The base of the cassette preferably bows inwardly, the transition between the base and the side walls of the cassette being formed by a corrugation. The cassette is preferably closed by means of a sealed, glued or welded lid. However, when

the container section and the lid each has four sides each of which has an outwardly extending rim, the lid may be held onto the rest of the cassette in a manner in which, for example, the rim of the container section, either on three sides or on two opposite sides, is folded upwardly and inwardly, in each case forming a groove in which the lid engages so as to be displaceable in one direction, and the rim of the lid, on the free side or on one of the free sides, is folded downwardly and inwardly, enveloping the container section rim on this side. Alternatively, the rim of the lid may be folded downwardly and inwardly on three sides, forming a groove in each case in which the rim of the container section engages, so as to be displaceable in only one direction, the rim of the container section being folded upwardly and inwardly on the fourth side and enveloping the rim of the lid on this side. Advantageously, the lid is provided with one or more inwardly extending depressions, the depression(s) being such that the plane which includes the innermost surface(s) of the depression(s) intersects the innermost edge of each of the ribs provided on the cassette side walls at a point where the innermost edge is still perpendicular to the basal plane of the cassette.

When the cassette according to the present invention is to be used in certain processing systems, it may be advantageous if the ribs provided in the side walls of the cassette have a stepped cross-section.

The invention will now be described, by way of example only, with reference to the accompanying drawing, in which

Fig. 1 is a sectional side view of a cassette according to the invention having a sealed or welded lid;

Fig. 2 is a sectional side view of a cassette according to the invention having a sliding lid;

Fig. 3 is another sectional side view of the cassette shown in Fig. 2;

Fig. 4 is a sectional side view of another cassette according to the invention having a sliding lid;

Fig. 5 is another sectional side view of the cassette shown in Fig. 4, and

Fig. 6 is a sectional plan view of a stepped side-wall rib.

The cassette shown in Fig. 1 is basically a shallow box having any desired size. Each side wall is provided with a rib 1 which projects inwards from the wall. However, as mentioned above, due to the method of manufacturing the cassette the inner edge of the rib 1 is not perpendicular to the basal plane at its upper and lower ends. The cassette is therefore provided, at the outer edge of the base 4, with an outwardly drawn, continuous peripheral corrugation 3, such that the actual bearing surface for the sheets

22 is at a level which is somewhat higher than the termination 5 of the ribs 1 of the cassette. The same result can be achieved, see Figs. 2 and 3, if the base 9 of the cassette is formed such that it has two or more inwardly drawn support ribs 6 by which contact with the film is ensured. In order to avoid any impairment to the sheets caused by uneven contact pressure, a stiff support sheet is preferably placed between the support ribs 6 and the lowest sheet. The support ribs 6 must have sufficient dimensions so that a plane imposed thereon intersects each of the ribs 1 of the cassette at a point where the inner edge 20 is still perpendicular to the basal plane 21 of the cassette. By means of an inwardly extending depression formed by a continuous peripheral corrugation 8 provided in the lid 7, even contact with the top sheets is ensured. Within the area of the sheets, this depression extends down somewhat below the rim of the cassette. The important criterion is again that a plane imposed upon the underside of the lid 7 intersects each of the ribs 1 at a point where the inner edge 20 is still perpendicular to the basal plane 21 of the cassette. The same result can be achieved if a cover sheet, whose thickness is larger than, or at least equal to, the radius 2 of the inner edges 20 of the ribs 1, is placed upon the sheets. For reasons to do with manufacturing technology, the sheets 22 may not be of a uniform thickness. However, the number of sheets to be packed in a cassette must always be the same. The thickness of the stack of sheets will therefore fluctuate within certain limits, but the sheets must nevertheless be held firmly in the cassette. This problem is overcome, according to the invention, in that the base 9 of the cassette bows inwardly in one direction, i.e. the same direction as the support ribs 6 provided thereon. The transition between the bowed base 9 of the cassette and the side walls in the longitudinal direction of the support ribs 6 is formed by a large radius corrugation 10. As a result, the curved base 9 of the cassette constitutes a resilient element which compensates for thickness variations in the stack of packed sheets. Closure of the cassette can be effected in various ways. For example, the lid 7 may be glued, sealed or welded to the cassette, as shown in Fig. 1. Sheets 22 will be removed by detaching the lid 7 by either tearing or cutting the seal. The lid 7 may be made from, for example, a resilient or a rigid sheet of a synthetic material or a plastic-coated aluminium foil. However, with this type of closure, the cassette cannot be re-closed once it has been opened. To obviate this disadvantage, the cassette may be closed by means of a sliding lid. As shown in Fig. 3, the outwardly

extending rim of the container section may be folded upwardly and inwardly through 180° on two opposite sides producing U-shaped grooves 11. In addition, one of the free outwardly extending rims of the lid is folded downwardly and inwardly through 180° to form a folded portion 12, see Fig. 2, which encloses the container section rim 23. In this way, a light-proof labyrinth is created and, moreover, the cassette is stabilised in these regions. In order to facilitate the withdrawal of the lid 7 from the grooves 11, the folded portion of the rim edge 12 which envelops the container section rim 23 is bent downwards through 90° to form the lip 13. In order further to safeguard the cassette, the fourth side can be made light-proof by means of an adhesive tape enveloping the container section rim and the lid 7, or, according to another embodiment of the invention, by folding the container section rim upwardly and inwardly through 180° in order to form a U-shaped groove 14 in which the rim 24 of the lid engages. As shown in Figs. 4 and 5, the U-shaped grooves may be alternatively provided on the lid 7. The lid 7 is then folded downwardly and inwardly through 180° on two opposite sides, so as to produce two U-shaped grooves 15 which envelop the container section rim 25. In Fig. 5, the container section rim 16 is folded up through 180° on one of the two free sides, so as to form a U-shaped groove which envelops the lid 7 in the manner of a labyrinth. On the fourth side, the rim 17 of the lid is folded down through 180°, so as to form a U-shaped groove enveloping the container section rim 26. This necessitates the provision of a recess on the lid 7 which prevents the folded portions of the lid rim 17 forming the grooves 15 and that of the container section rim 16 from fouling each other.

When a cassette according to the invention is placed in a processing unit, accurate positioning in the cassette holder of the unit must be achieved. The demands made to the manufacturer of the processing unit frequently stipulate that different types of cassette material should be usable, and this excludes tailor making the processing unit for a particular kind of cassette. Furthermore, a comparatively thin-walled cupped cassette is not suitable for continuous use in a processing unit, and a thick-walled cassette must therefore be employed for this purpose. In order to enable a cupped cassette according to the invention to be employed under the same conditions of insertability as a thick-walled cassette produced to suit the processing unit, the ribs 1 of the side walls have to be specially shaped. This solution presupposes that the ribs 1 cooperate with stops 19 forming part of the processing unit, see Fig. 6. By

providing a step 18 in the cross-section of the ribs 1 it is possible to ensure that the sheets 22 are correctly positioned by the inner edges 20 of the ribs 1 which are perpendicular to the basal plane 21 of the cassette, and that the stops 19 of the cassette holder of the processing unit cooperate with the shoulder 1. The distance between the inner edge 20 of the ribs 1 and the step 18 corresponds to the wall-thickness of the cassette specially made for continuous use in the processing unit. The cassette according to the invention is a container not only for loose sheets, but also for sheets wrapped or sealed in a light-proof manner in paper, a plastics material or metal foil.

WHAT WE CLAIM IS:—

1. A cassette which comprises a container section having a base and side walls, and a lid for the container section, at least the container section comprising a synthetic material capable of being deep-drawn, each of the side walls of the container section having at least one inwardly projecting rib, the innermost edge of each rib being substantially perpendicular to the general plane of the cassette base.

2. A cassette, as claimed in claim 1, wherein the cassette base is provided with two or more inwardly drawn support ribs such that the plane which includes the tops of the support ribs intersects the innermost edge of each of the ribs on the side walls of the cassette at a point where the said innermost edge is still perpendicular to the basal plane of the cassette.

3. A cassette as claimed in claim 1 or claim 2, wherein the base of the cassette bows inwardly in one direction and the transition between the base and the side walls comprises a corrugation.

4. A cassette as claimed in any one of claims 1 to 3, wherein the lid is sealed, glued or welded to the container section.

5. A cassette as claimed in any one of claims 1 to 3, wherein the container section and the lid each has four sides each of which has an outwardly extending rim, the rim of the container section being folded upwardly and inwardly either on three sides or on two opposite sides to form a groove in each case, the lid being engageable in the grooves and the rim of the lid being folded downwardly and inwardly on the free side or on one of the free sides, to envelop the container section rim on that side.

6. A cassette as claimed in any one of claims 1 to 3, wherein the container section and the lid each has four sides each of which has an outwardly extending rim, the rim of the lid being folded downwardly and inwardly on three sides to form a groove in each case, the container section being engageable in the grooves and the rim of the container

section being folded upwardly and inwardly on the fourth side to envelop the rim of the lid on that side.

- 5 7. A cassette as claimed in any one of claims 1 to 6, wherein the lid has one or more inwardly extending depressions, the depression(s) being such that the plane which includes the innermost surface(s) of the depression(s) intersects the innermost
10 edge of each of the ribs on the side walls of the cassette at a point where the said innermost edge is still perpendicular to the basal plane of the cassette.

- 15 8. A cassette as claimed in any one of claims 1 to 7, wherein the ribs provided in the side walls of the cassette have a stepped cross-section.

9. A cassette as claimed in any one of claims 1 to 8, wherein the synthetic material which is capable of being deep-drawn is
20 light-proof.

10. A cassette substantially as described herein with reference to, and as illustrated by, the accompanying drawings.

11. Sheet-like material whenever pack-
25 aged in a cassette as claimed in any one of claims 1 to 10.

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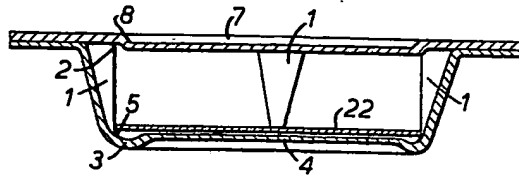


FIG. 1.

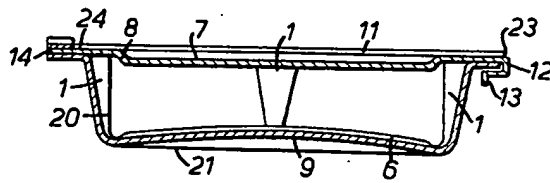


FIG. 2.

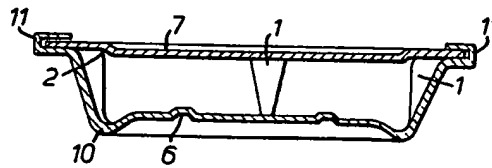


FIG. 3.

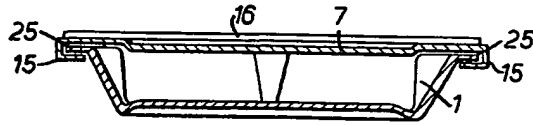


FIG. 4.

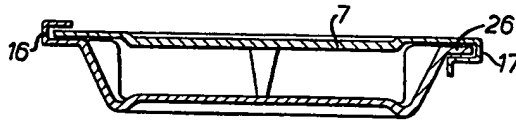


FIG. 5.

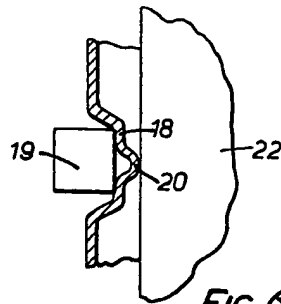


FIG. 6.